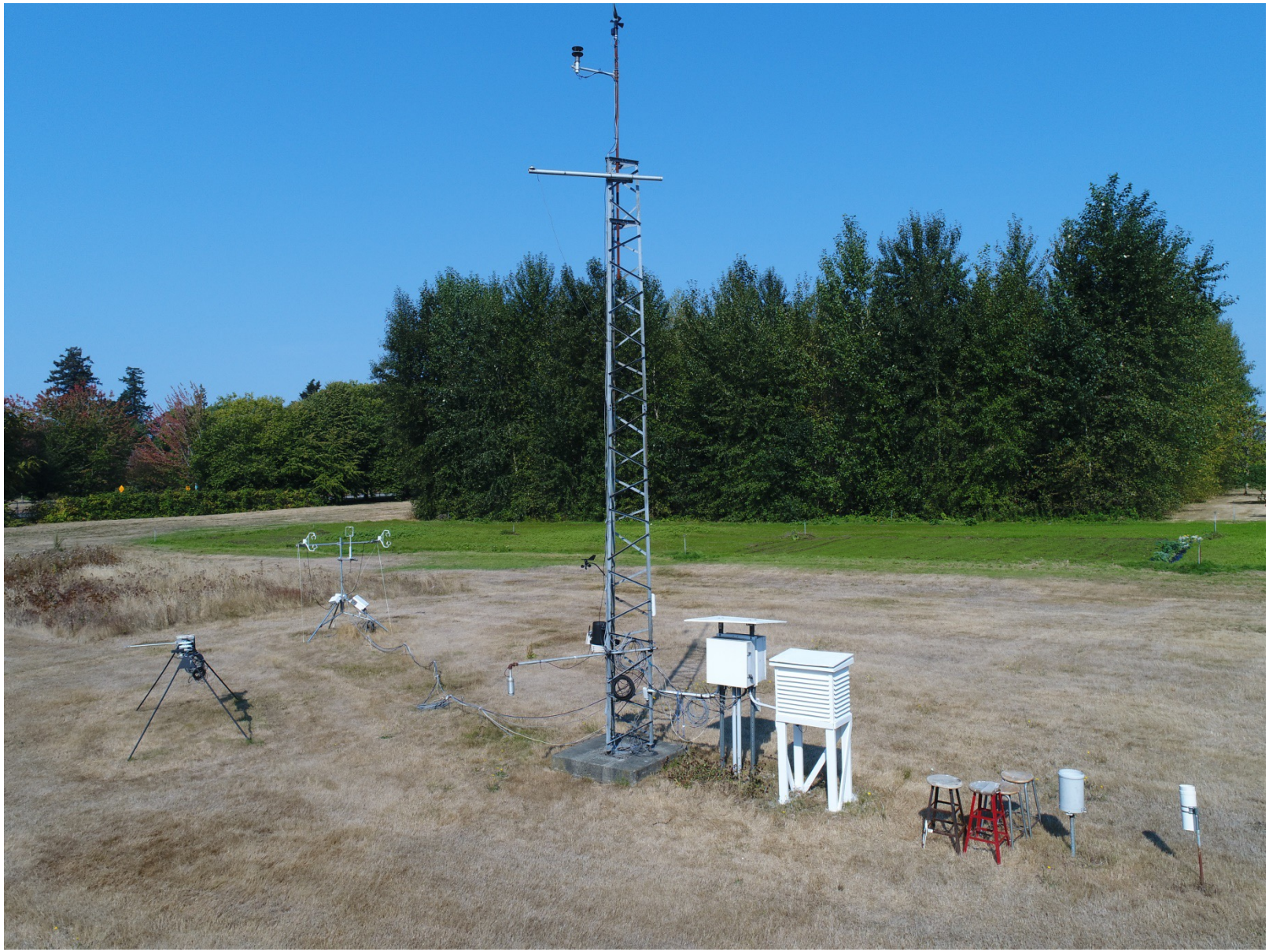
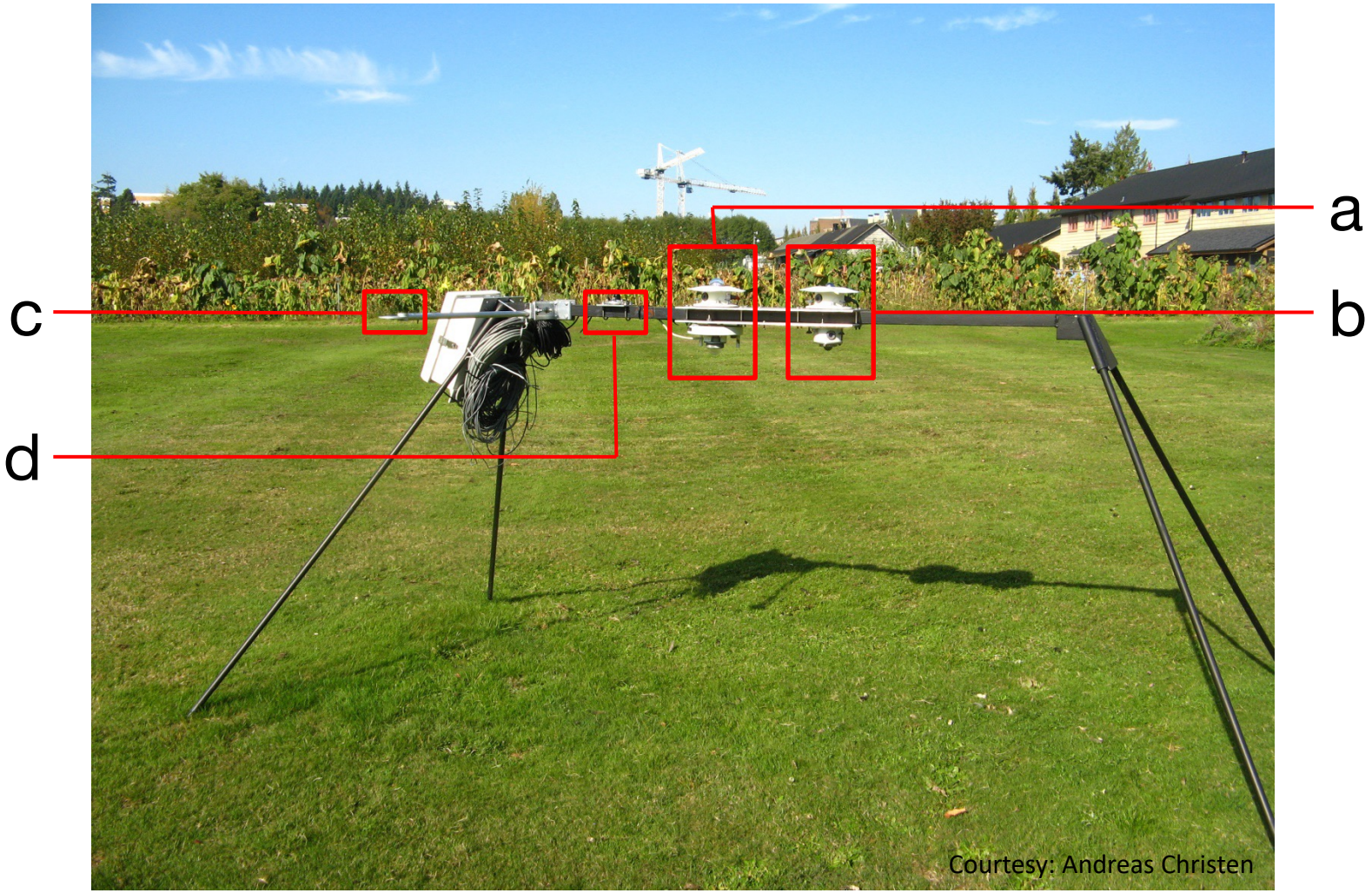
Weather Station



Radiometer set-up



a

Pyranometer – measures shortwave radiation

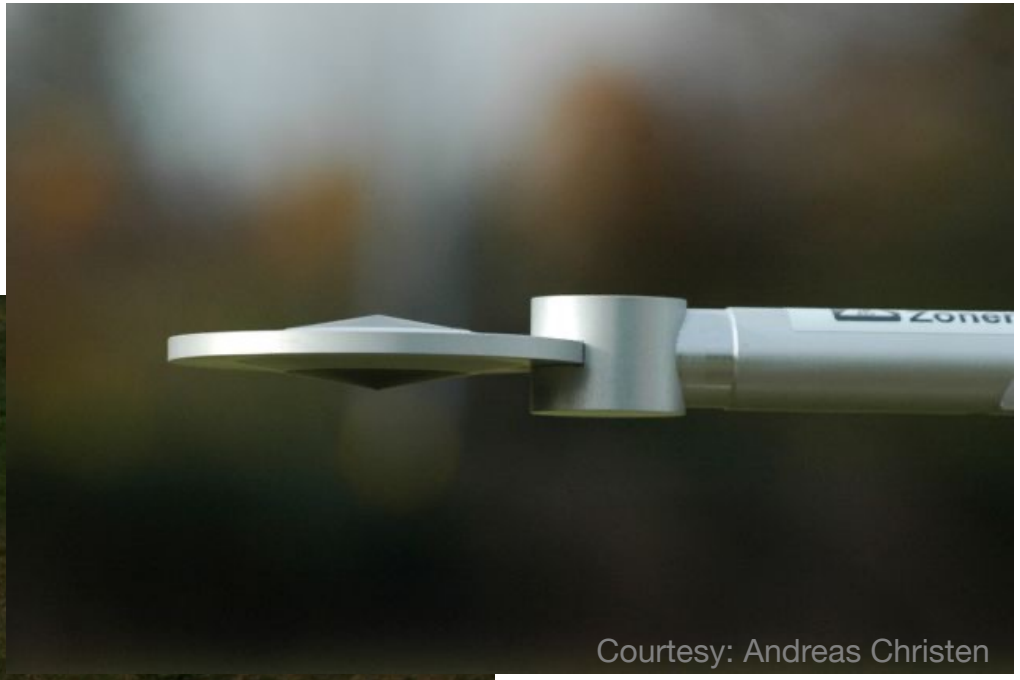
Sensor	Measured parameter	Sensing principle	Dome material
Pyranometer	Short-wave irradiance ($K\downarrow$) – or short-wave reflectance ($K\uparrow$) if installed upside down. It integrates over the solid angle 2π.	Black carbon absorber heats up. A thermopile measures the resulting temperature difference between absorber and body. Alternative: photodiodes (see Fig. 1).	Glass [1]

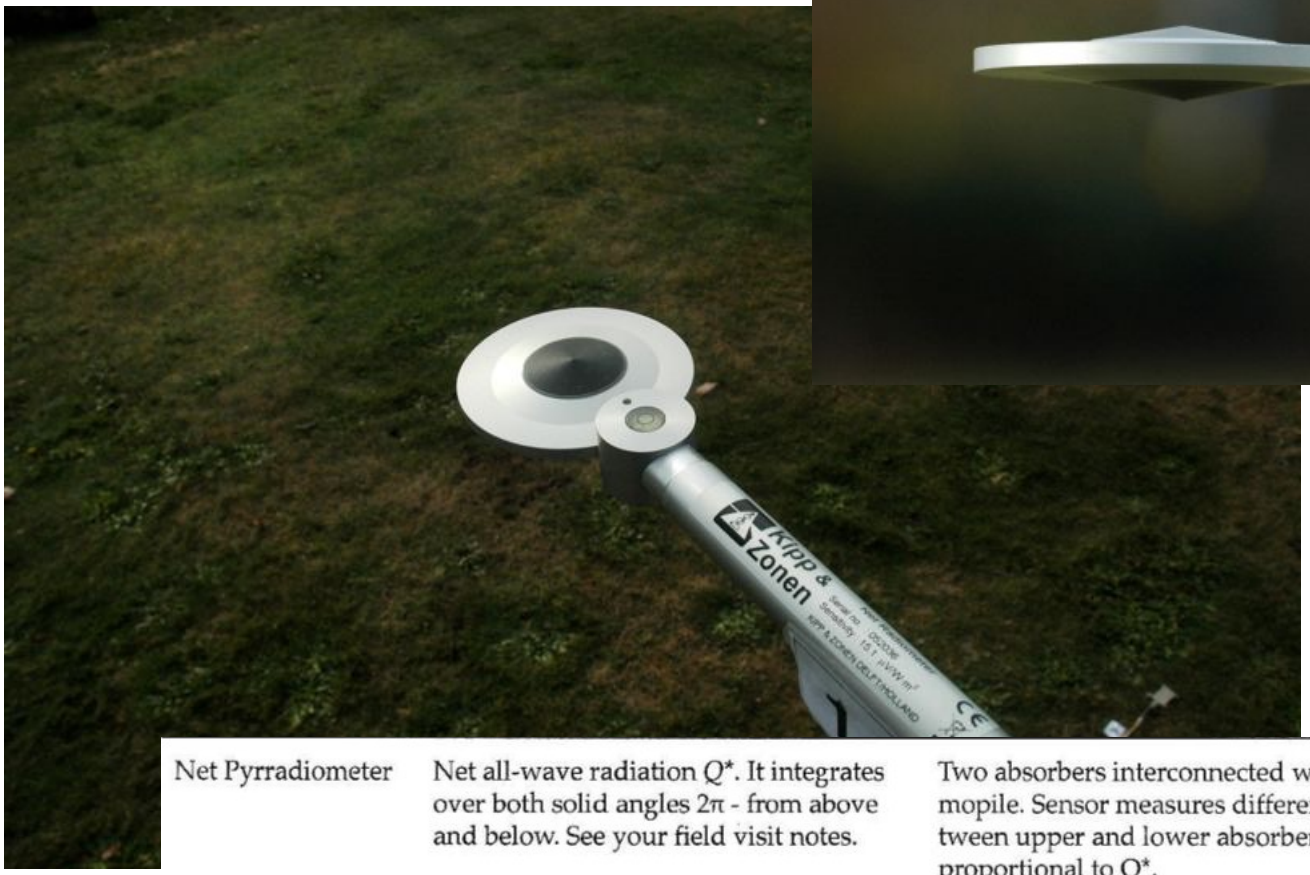
b

Pyrgeometer – measures longwave radiation

Pyrgeometer	Long-wave irradiance $L\downarrow$ - or long-wave emittance plus reflectance $L\uparrow$ if installed upside down. It integrates over the solid angle 2π.	Similar to pyranometer - i.e. black carbon absorber on a thermopile measures temperature increase of the absorber vs. body. Handling long-wave is more difficult because we must consider the sensor's own emission in addition to that of the surface (dome and body temperatures monitored).	Silicon

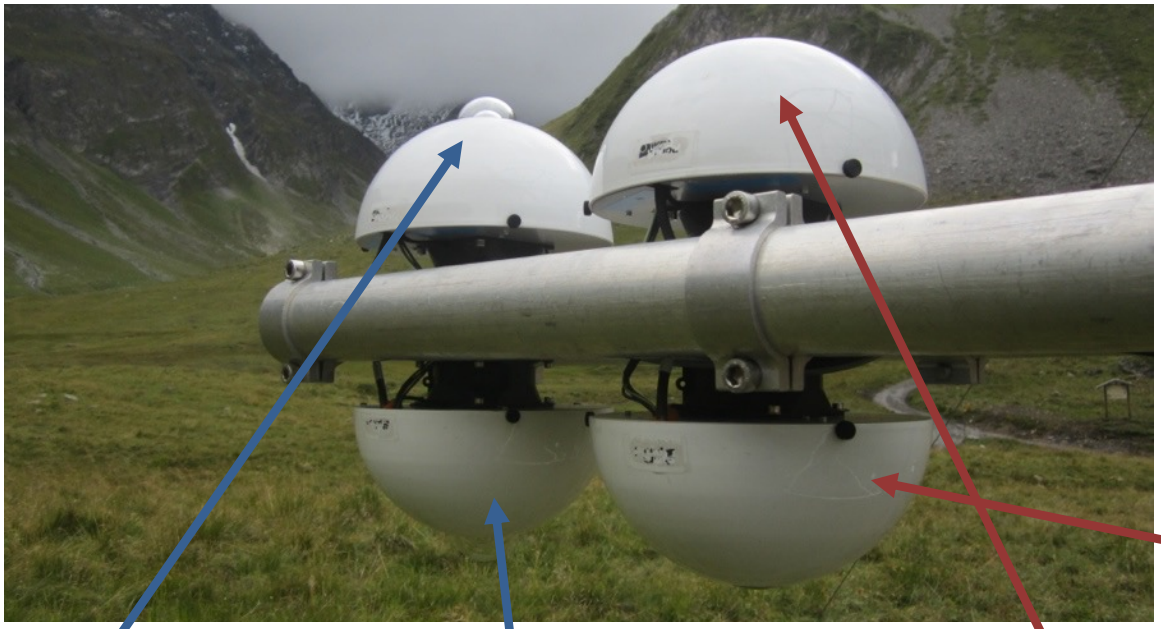
c Net all-wave radiometer – measures Q*





Net Pyrradiometer	Net all-wave radiation Q^*. It integrates over both solid angles 2π - from above and below. See your field visit notes.	Two absorbers interconnected with a thermopile. Sensor measures difference between upper and lower absorber which is proportional to Q^*.	None or PE

Net all-wave budget



$K\downarrow$
Incoming

$K\uparrow = \alpha K\downarrow$
Reflected

Absorbed
$K\downarrow(1 - \alpha)$

$L\uparrow$

$L\downarrow$
Incoming

$L\downarrow(1 - \varepsilon_0)$
Reflected

$+ \ \varepsilon_0 \sigma T_0^4$
Emitted

Absorbed
$\varepsilon_0 L\downarrow - \varepsilon_0 \sigma T_0^4$

d

Quantum sensor – measures photosynthetically active radiation (PAR*)

LI-COR Inc.

*Also called photosynthetic photon flux density (PPFD)